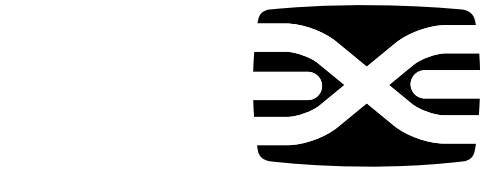

EMULEX®

We network storage

Emulex Driver for HP-UX

Version 5.31.09

User Manual

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Installation

Driver Information

Supported Features

- Supports 64 Host Bus Adapters (HBAs)
- Supports 1-gigabyte (Gb), 2-Gb or 4-Gb link attachments
- Supports Peripheral Component Interconnect (PCI)-X 2.0 and PCI-Express HBAs
- Supports 256 LUNs per target
- Supports persistent logical unit number (LUN) automapping (for more information, see “LUN Automapping” on page 15)
- Supports consistent target ID via persistent binding (for more information, see “Setting Up Persistent Binding” on page 16)
- Dynamic loading and unloading of the driver module via Dynamic Loadable Kernel Module (DLKM)
- Parameter setting via the configuration file (lpfc.conf)
- Crash dump trace analysis support
- Supports ServiceGuard high-availability clustering
- Supports HBA hot/plug/hot swap through On-Line Add/Replace (OLRAD) compliance using the 'olrad' utility
- Hazard tested

Prerequisites

- HP-UX 11i version 2 (HP-UX 11.23) (64-bit)
- 64 MB system random access memory (RAM)
- Installed Emulex Fibre Channel (FC) HBA

Compatibility

- Emulex FC HBAs LP11002e and LP11000e (minimum firmware version 2.50a8)
- Emulex FC HBAs LP11002 and LP11000 (minimum firmware version 2.10a7)
- Emulex FC HBAs LP10000DC and LP10000DC (minimum firmware version 1.90a4)
- Emulex FC HBAs LP9802 and LP9802DC (minimum firmware version 1.90a4)
- Emulex FC HBAs LP9002 and LP9002DC (minimum firmware version 3.90a7)

- Hewlett Packard 64-bit Itanium processor platforms (Emulex testing was performed using the March 2006 and June 2006 Support Bundle/Operating System Releases):
    - rx8600 series
    - rx7600 series
    - rx5600 series
    - rx/cx2600
    - rx1600 and rx4640
- Supported Backplanes:
    - PCI or PCI-X
    - PCI-Express (requires an appropriate operating system release)

Things to Know Before You Download

- Before you download, create a temporary directory for the driver kit.
- Before you update your driver, make backup copies of critical files.

Known Issues

- Discovering Disk Drives

  To list all the small computer system interface (SCSI) devices discovered by the lpfc driver, enter:
  ```
  ioscan -fknC disk
  ```
  To list newly attached devices, it is necessary to first run 'ioscan'. Type:
  ```
  ioscan -fnC disk
  ```
  Sometimes the driver recognizes disk drives at boot time, but you won't be able to use those drives because special file entries for them do not exist.

  To create these special files, run:
  ```
  insf
  ```
- Different SCSI Target IDs on Different Hosts

  An FC target is assigned its destination identification (D_ID) at loop initialization time; the SCSI target ID for that target is assigned by the device driver when the device is first discovered. It is possible for the D_ID to change between one loop initialization and the next. Every time a system boots or a target is added to, or removed from, the Fibre Channel, the loop will re-initialize. After a system has booted, it will maintain a constant view of the same target ID because the driver software remaps the SCSI target ID to the new D_ID on the fly. However, a second system may use a different SCSI target ID for that target. Thus, if you are seeking to work with the same target across multiple hosts you must be prepared to encounter the situation where the same Fibre Channel target is known by different SCSI target IDs. The persistent binding feature of this device driver can maintain a consistent target ID on all systems.
- Drive Light Turns Off

  On some disk drives with down level firmware, the drive light will turn off. Typically, the drive light does not turn on again under its own power. In some situations, however, the light will turn on when a command to it times out and the driver tries to abort the command. It may also turn on at the next loop event. Contact the drive manufacturer for new firmware to fix the problem.

- LIP type F8

  Some disk drive firmware does not recover from a Loop Initialization Primitive (LIP) type F8 the way other Fibre Channel devices expect. This situation can result in a loop full of confused devices. To recover from this situation, reboot all the hosts and power cycle all the disk drives.

  Unfortunately, it may be difficult to recognize that an LIP type F8 has occurred: subsequent loop events may obscure the relevant log messages on the console or in the system log. The Emulex Digital Hub will bypass devices sending LIP type F8, and keep the loop up and running.

- kcmodule lpfc=unused

  Upon the first attempt to issue 'kcmodule lpfc=unused', the driver may fail to unload when in fact it is not in use. The second attempt to issue the command will succeed.

Cautions and Warnings

- If possible stop I/O being performed by an HBA before updating firmware or resetting the HBA.

Files Included in this Release

This driver kit includes the following files:

Table 1: Driver Kit Files

File Name	Description
/opt/lpfc/conf/lpfc.conf	Main configuration file
/opt/lpfc/bin/lputil	LightPulse maintenance utility
/opt/lpfc/bin/dfc	Use under tech support guidance
/opt/lpfc/bin/lptrace /opt/lpfc/bin/yanktrace	Use under tech support guidance
/opt/lpfc/mod/lpfc	lpfc driver module (for maintenance). This file is installed in the /stand/current/mod and usr/conf/mod directories.
/opt/lpfc/mod/lpfc.prep	lpfc module preparation script (for reference only)
/opt/lpfc/comf.lpfc.version	Driver version number
opt/lpfc/bin/showhba	Utility to list the HBAs discovered by the driver and their respective HP-UX hardware paths.

Important Files

You may need to modify the following file after installing the driver or if your hardware configuration changes, such as by adding additional disk drives to the FC interface.

lpfc.conf

The configuration parameters file specifying tunable parameters for all Emulex LightPulse® HBAs attached to the host machine. This file is located in /opt/lpfc/conf.

Installing the Driver

Follow these instructions to install the driver. While it is possible to install lpfc onto one or more clients from a server, that procedure is not covered here; refer to your HP-UX system administration documentation for that procedure.

For ease of installation, the LightPulse configuration utility (lputil) is bundled and installed with the driver.

WARNING: If a prior version of the lpfc device driver is already installed on the system, you must uninstall it. See “Uninstalling the Driver” on page 5 for instructions.

Note: A new lpfc.conf file is copied into the opt/lpfc/conf/ directory during installation. If this driver was previously installed and you have configuration changes you wish to save, copy the original /opt/lpfc/conf/lpfc.conf file to a safe place and transfer any edits from the old file to the new file after installation.

To install the Emulex driver for HP-UX:

1. Install a supported Emulex HBA in the system. Refer to the HBA's Installation manual for specific hardware installation instructions.
2. Log on as 'root'.
3. Load the depot file from your distribution medium into a directory, referred to here as <driver-download-directory>. The depot file name is

   ```
   lpfc.depot-05_31_09-HPUX11iv2_64_dlkm.Z
   ```
4. At the shell prompt type:

   ```
   cd <driver-download-directory>
   uncompress lpfc.depot-05_31_09-HPUX11iv2_64_dlkm.Z
   swinstall -s `pwd`/lpfc.depot-t-05_31_09-HPUX11iv2_64_dlkm
   ```

   Note: Substitute the appropriate information for the driver-download-directory (label in angle brackets).

   Note: If after you download, the file name ends in lowercase (.z), then you must rename the file name to use uppercase (.Z). Example (all on one line):

   ```
   mv lpfc.depot-05_31_09-HPUX11iv2_64_dlkm.z
   lpfc.depot 05_31_09-HPUX11iv2_64_dlkm.Z
   ```

   The lpfc driver module will be loaded automatically with the default settings. The product files will be installed under various directories including the /opt/lpfc directory.

Before you proceed, decide whether you must change any driver configuration parameter, beyond the defaults established by the installation process.

To modify the default driver configuration parameters and to have the changes take effect:

1. Issue the following command:

   ```
   kcmodule lpfc=unused
   ```
2. Use a text editor to modify the desired driver configuration parameters in the lpfc.conf file, which is located in the /opt/lpfc/conf directory. For more information, see "Changing Configuration Parameters".
3. After the parameters have been changed, issue the following command:

   ```
   kcmodule lpfc=loaded
   ```

Two additional files, lpfc.conf.load and lpfc.conf.boot, are created under the /opt/lpfc/conf directory during the installation process. The first is created when the module is being loaded while the system is up, and the second is created during system reboot. These two files should be identical. Both contain the same lpfc.conf file but with all comments, spaces and tabs stripped out. This is the portion of the config file that the driver read. It is for verification purpose.

When the driver is loaded, you can query the status of the lpfc module using the following command:

```
# kcmodule -v lpfc
```

Uninstalling the Driver

The driver can be removed by using swremove. Run the following commands:

```
kcmodule lpfc=unused
swremove LPFC
```

All files under /opt/lpfc will be saved under /opt/lpfc_<release number> (for example, lpfc_05.31.09).

Note: If you are installing another driver version, the system should be rebooted prior to installation of the new version.

For further information on installing and removing drivers, consult the HP-UX system administration documentation and the swinstall(1M) and swremove(1M) manual pages.

Configuration

Introduction

To perform the following tasks, use a text editor to change the lpfc.conf file.

- Change configuration parameters. For more information, see “Changing Configuration Parameters” on page 8.
- Set up persistent binding and LUN blocking. For more information, see “FC Device Binding” on page 15.

Note: The lpfc.conf file resides in the /opt/lpfc/conf directory.

Loading and Unloading the Driver (DLKM)

The Emulex driver for HP-UX enables you to load or unload the driver as a Dynamically Loadable Kernel Module (DKLM), to build the driver into the kernel and to get the current load status of the driver.

To load the driver as a module type:

```
kcmodule lpfc=loaded
```

To unload the driver as a module type:

```
kcmodule lpfc=unused
```

To get the current status of the driver (loaded or unloaded) type:

```
kcmodule [-v]lpfc
```

To build the driver into the kernel as a static driver type:

```
kcmodule lpfc=static
```

Adding or Replacing Adapters (OLRAD)

The Emulex driver and adapters comply with OLRAD. New or replaced Emulex host bus adapters (HBAs) will be recognized by HP-UX. Run ioscan to make the attached LUNs and targets visible to the operating system.

Consult the system's man pages for more information.

Note: A different HBA model may be added, but the operating system will not allow a different HBA model to be used as a replacement.

Reading Device Files

The driver provides a simple status reporting mechanism through "cat"ing the driver device files.

To view the content of the lpfc.conf file that was read during module loading, with all comments, spaces and tabs stripped out, type:

```
$ cat /dev/lpfc1
```

Following is an example of the output of lpfc1:

```
num-iocbs=1024;
num-bufs=1024;
topology=6;
lpfc0-fcp-bind-WWNN="5005076300c083b5:77";
```

To view the LUN mapping set up in the driver for all targets seen, issue the following command:

```
$ cat /dev/lpfc2
```

Following is an example of the output of lpfc2:

Table 2: lpfc2 Output Example

FC	SID	WWPN	LCNT	
00	077	50:05:07:63:00:c0:83:b5	0009	000:4000 001:4001 002:4002 003:4003 004:4004 007:4007 009:4009 01c:401c 01f:401f
02	000	10:00:00:d0:80:00:02:ed	0007	000:4000 SEQUENTIAL
03	001	50:05:07:63:00:c0:83:b5	0001	000:0000

The fields in Table 2 are as follows:

- FC lists the index of the board, in decimal.
- SID lists the SCSI ID of the target, in decimal .
- WWPN lists the world wide port name.

  Note: This heading entry and column entries are determined by the automap variable in the /opt/lpfc/conf/lpfc.conf file (see Table 3 for more information on the automap variable). The automap setting determines if the data presented is the WWPN (default), world wide node name (WWNN) or destination ID (DID).

- LCNT lists the number of LUNs supported by the target, in decimal.
- Lun Map lists the mapping for each LUN in the target.
- "SEQUENTIAL" indicates the mappings are sequential, thus the list is omitted.

This information is also saved in /opt/lpfc/conf/lpfc.lunmap by the driver during loading.

Changing Configuration Parameters

To modify the driver configuration parameters and have the changes take effect:

1. Issue the following command:

   ```
   kcmodule lpfc=unused
   ```

2. Use a text editor to modify the desired driver configuration parameters in the lpfc.conf file, located in the /opt/lpfc/conf directory. See Table 3 for parameter descriptions.

Caution: The Emulex lpfc driver searches the configuration file for keywords. Entries with incorrect keywords are ignored, therefore no error message will be logged.

3. Unload and reload the lpfc module to have the saved changes take effect:

   ```
   # kcmodule lpfc=unused
   # kcmodule lpfc=loaded
   ```

4. After the lpfc module loads, query the lpfc module using the following command:

   ```
   # kcmodule -v lpfc
   ```

5. To discover hardware, view bindings and view LUNS, run the ioscan command. See “Interpreting the Hardware Path by IOSCAN” on page 20 for more information.

lpfc.conf File Parameters

The driver parameters determine some aspects of the driver behavior. Table 3 lists the driver parameters and their descriptions. This table also lists the default, minimum and maximum values.

Table 3: lpfc.conf File Parameters

Variable	Default	Min	Max	Comments
ack0	0	0=Off	1=On	Use ack0 for Class 2. • If set to 1, the HBA tries to use ack0 when running Class 2 traffic to a device. If the device does not support ack0, then the HBA uses ack1. • If set to 0, only ack1 is used when running Class 2 traffic.
automap	2	0	3	How the driver assigns SCSI IDs to FCP targets detected in the fabric environment. The ID assignments are based on the order they are received from the name server. • If set to 0, there is no automatic assignment of SCSI IDs. They are assigned according to bind entries in the lpfc.conf only. • If set to 1, automatically assigns SCSI IDs based upon WWNN (‘Bind by WWNN’). • If set to 2, automatically assigns SCSI IDs based upon WWPN (‘Bind by WWPN’). • If set to 3, automatically assigns SCSI IDs based upon D_ID (‘Bind by D_ID’).
check-cond-err	0	Boolean 0=false 1=true		If set to 1, the driver treats these conditions as FCP RSP errors: • 0x44, Internal Target Failure. • 0x25, Logical Unit Not Supported. • 0x20, Invalid Command Operation Code.
delay-rsp-err	1	Boolean 0=false 1=true		If set to 1, the driver delays FCP RSP errors returned to the upper SCSI layer based on the no-device-delay parameter value.

Table 3: lpfc.conf File Parameters (Continued)

Variable	Default	Min	Max	Comments
dqfull-throttle	1	Boolean 0=false 1=true		If set to 1, decrements LUN throttle on queue fulls. This parameter causes lpfc to decrement a LUN's throttle (maximum queue depth) if a queue full condition is received from the target. The queue depth is decremented to a minimum of 3. The only way to restore the queue depth (besides rebooting) back to the original LUN throttle is by running the command /opt/lpfc/conf/sresetqdepth *X*. This command restores the LUN throttle of all LUNs for adapter *X* back to the original value.
dqfull-throttle-up-time	1	0	30	Specifies a number of seconds (*x* seconds). A timer starts and increments the current queue depth every *X* seconds.
dqfull-throttle-up-inc	1	1	128	Specifies a number to increment to the current queue depth.
fcp-bind-*XXXX*				If present, enables persistent binding of designated (or predefined) target's SCSI IDs to FC devices, as opposed to automatically assigning them by the driver software based on the order in the name server. **Note:** For more information regarding fcp-bind-*XXXX*, see "FC Device Binding" on page15".
fcp-class	3	2	3	• If set to 2, the lpfc driver is transmits FCP data in Class 2. • If set to 3, the lpfc driver transmits FCP data in Class 3.
fcpfabric-tmo	0	0	255	Extra timeout value, in seconds, to be applied to each FCP command sent.

Table 3: lpfc.conf File Parameters (Continued)

Variable	Default	Min	Max	Comments
link-speed	0	0	2	• If set to 0, enables auto-negotiation of link speed. • If set to 1, forces 1-Gb speed. • If set to 2, forces 2-Gb speed. • If set to 4, forces 4-Gb speed (4-Gbit HBAs only).
linkdown-tmo	30	0	255	How many seconds the driver waits after detecting link down until it notifies the upper layer that the device has disappeared.
lun-q-depth	30	1	128	Override default limit for the number of simultaneous commands to issue to a single LUN on a single target on the loop. A single LUN is never sent more commands than allowed by cfg-dft-lun-q-depth. However, less commands may be sent when the cfg-dft-tgt-q-depth is reached for the entire target.
tgt-q-depth	0	0	10240	Override default limit for the number of simultaneous commands to issue to a single target on the loop. A single target is never sent more commands than allowed by cfg-dft-tgt-q-depth. If tgt-q-depth is set to 0, no target throttling occurs.
no-device-delay	1	0	30	This value determines the length of the interval between deciding to fail an I/O because there is no way to communicate with its particular device (such as due to device failure or device removal) and actually failing the command. A value of zero causes no delay. The delay is specified in seconds. A minimum value of 1 (1 second) is recommended when communicating with any Tachyon-based device.
nodev-tmo	0	0	255	Seconds to hold I/O if device disappears. I/O errors are held for the number of seconds specified.

Table 3: lpfc.conf File Parameters (Continued)

Variable	Default	Min	Max	Comments
num-bufs	512	64	4096	This variable specifies the number of command buffers to allocate. These buffers are used for Fibre Channel Extended Link Services (ELS), and one for each FCP command issued in SLI-2 mode. If you want to queue a lot of FCP commands to the HBA, increase num-bufs for better performance. These buffers consume physical memory and are also used by the device driver to process loop initialization and re-discovery activities. Important: The driver must always be configured with at least several dozen ELS command buffers; at least 256 are recommended.
num-iocbs	512	128	10240	This variable indicates the number of input/output control block (IOCB) buffers to allocate. IOCBs are internal data structures that send and receive I/O requests to and from the LightPulse hardware. Too few IOCBs can temporarily prevent the driver from communicating with the HBA, thus lowering performance. (This condition is not fatal.) If you run heavy IP traffic, you should increase num-iocbs for better performance.

Table 3: lpfc.conf File Parameters (Continued)

Variable	Default	Min	Max	Comments
scan-down	2	0	2	The scan-down variable is used in loop topology. If a loopmap is present, the order of the loopmap determines the discovered order. If a loopmap is not present, the order of AL_PA is scanned. Three scanning algorithms are used to map an AL_PA to a SCSI ID in a private loop. • If set to 0, the driver starts with the lowest ALPA (lowest ID) when assigning SCSI IDs. • If set to 1, the driver starts with the highest ALPA (highest ID) when assigning SCSI IDs. • If set to 2, the driver hard maps the Loop ID and the SCSI ID. Set to 2 when the loop is private. This will disable persistent binding and force AL_PA binding.
topology	0	0	6	This variable controls the Fibre Channel topology expected by lpfc at boot time. Fibre Channel offers point-to-point, fabric, and arbitrated loop topologies. • If set to 0, the driver attempts loop first. If unsuccessful, the driver attempts point-to-point. • If set to 2, the driver attempts point-to-point only. • If set to 4, the driver attempts loop only. • If set to 6, the driver attempts point-to-point first. If unsuccessful, the driver attempts loop.
use-adisc	0	Boolean 0=false 1=true		If set to 1, the driver send ADISC instead of PLOGI for device discovery.
log-only	1	0	1	• If set to 1, log messages are logged only to /var/adm/syslog/syslog.log. • If set to 0, log messages are also printed on the console. **Note:** If syslogd is started with -D (HP-UX default), messages cannot go to the console.

Table 3: lpfc.conf File Parameters (Continued)

Variable	Default	Min	Max	Comments
log-verbose	0	0	0xff	(Bit mask) If set to non-zero, causes the driver to generate additional messages concerning the driver and I/O operations. These messages may go to the system log file, /var/adm/syslog/syslog.log. **Note:** If syslogd is started with -D (the HP-UX default), these messages cannot go to the console.
zone-rscn	0	0	1	• If set to 1, the driver checks the NameServer data to see if an N_Port ID received in an RSCN is pertinent to the HBA. This behavior is necessary when running soft zoning in a Brocade fabric. • If set to 0, the RSCN is assumed to apply to this HBA, and no NameServer query is performed.

FC Device Binding

LUN Automapping

Three driver parameters (scan-down, automap and fcp-bind-*XXXX*) determine how the Emulex driver maps FC devices. Mapping assigns a unique ID to a device. This unique ID is known as the FC device ID or the FC SCSI target ID.

- **scan-down** - deals only with loop topology, either public or private. But if the loopmap is present, scan-down has no effect. The order of AL_PAs in the loopmap determines the ID of the device discovered. The scan-down parameter deals only with the static AL_PA map table, which is a table defined by an informative annex in the FC-AL profile. An informative annex provides useful information but is not part of the actual body of the standard. In this case, the AL_PA table maps all possible AL_PAs of FC devices into loop IDs from 0 to 126.

  Note: The automap parameter must be set to 1, 2 or 3 for the scan-down parameter to take effect.

  - If set to 0, the driver assigns the loop ID to the device by scanning the static AL_PA map table from low AL_PA to high AL_PA.
  - If set to 1, the driver uses an inverted AL_PA map, scanning AL_PAs from high AL_PA to low AL_PA.
  - If set to 2, persistent binding is disabled and the driver forces AL_PA binding (if the current SAN topology is private loop). This is the default.
  - If an AL_PA loopmap is present, scan-down has no effect. If the loopmap is present, the loopmap determines the ID of the device discovered.
- **fcp-bind-*XXXX*** - enables binding of pre-defined IDs to FC devices. The method of persistent target binding can use the device's WWPN, WWNN or D_ID.

  Note: The scan-down parameter must be set to 0 or 1 for persistent binding to work. If the devices are in a private loop environment and the scan-down parameter is set to 2, persistent target binding will not work.
- **automap** - controls how IDs of FC devices without persistent bindings are generated.
  - If set to 0, the system recognizes only devices with persistent bindings.

  Note: If automap is set to 0 and there are no persistent bindings, the driver shuts down and no FC devices are recognized by the system.

  - If set to 1, the driver automatically assigns SCSI IDs based upon WWNN.
  - If set to 2 (default), the driver automatically assigns SCSI IDs based upon WWPN.
  - If set to 3, the driver automatically assigns SCSI IDs based upon D_ID.

Table 4: FC Device Binding

Binding Types	Topology	automap	fcp-bind -*XXXX*	scan-down
fcp-bind-*XXXX* only	Any	0	WWPN, WWNN, D_ID	Ignored
AL_PA binding only	Private loop	Non-zero	Ignored	2
Automap only	Fabric	1, 2, 3	None	Ignored
fcp-bind and AL_PA binding	Loop	Non-zero	WWPN, WWNN, D_ID	0,1

Table 4: FC Device Binding (Continued)

Binding Types	Topology	automap	fcp-bind -*XXXX*	scan-down
fcp-bind and automap	Fabric	1, 2, 3	WWPN, WWNN, D_ID	Ignored

Setting Up Persistent Binding

Targets without persistent binding may have different hardware paths after system reboots. Persistent binding causes the binding between the FC devices and the OS device files to remain the same across system reboots provided the same devices are present. There are three ways to bind FC targets:

- Bind-by-ID - target binds to a fixed HP-UX hardware path. Therefore, devices within a target bind to fixed HP-UX device files (i.e. /dev/rdsk/c7t0d5).
- Bind-by-name - target binds to a symbolic name (user-defined). Therefore, devices within a target bind to fixed names (i.e. /dev/rdsk/va74.0005)
- Bind-by-name-and-ID - target binds to a fixed HP-UX hardware path as well as to a symbolic name (user-defined). Therefore, devices within a target bind to fixed HP-UX device files as well as fixed names.

- The lpfc.conf file, located in the /opt/lpfc/conf directory, contains persistent binding variables as well as all of the variables that control driver initialization.

To set up persistent binding:

1. Go to the /opt/lpfc/conf directory and open the lpfc.conf file in a text editor.
2. Set the scan-down and automap parameters. See “FC Device Binding” on page 15 for more information.
3. Set up persistent binding entries.
4. Save your changes.
5. Unload and reload the lpfc module to have the saved changes take effect:

   ```
   # kcmodule lpfc=unused
   # kcmodule lpfc=loaded
   ```
6. After the lpfc module loads, query the lpfc module using the following command:

   ```
   # kcmodule -v lpfc
   ```
7. Check the bindings in effect using the following command:

   ```
   # ioscan -fnk
   ```

   See “Interpreting the Hardware Path by IOSCAN” on page 20 for more information on the IOSCAN Report.

Formats of Bind Entries and Examples

Bind-by-ID Specifics

Caution: For private loop configurations, the scan-down configuration parameter must be set to 0 or 1 to force persistent binding to take effect. 2 is the default.

The Bind-by-ID method binds fixed hardware paths to FC devices. There are some applications, ie.SAM, which rely on the traditional HP-UX device file syntax.

Prerequisites

Gather the following information before you bind-by-ID:

- The HBA's index (instance) number connected to the target.
- The target's unique ID & ID type.
- The SCSI ID (user-defined) assigned to the target.
- Any LUNs within the target which need to be temporarily hidden (blocked).

Syntax Rules

Follow these rules when you bind-by-ID:

- Terminate all complete binding statements with semicolons (;).
- Use only one binding method per lpfc interface.
- Spaces, tabs, or new lines are allowed between binding entries.

Syntax

```
lpfc<HBA_index>-fcp-bind-<ID_type>=<binding_entry>[,<binding_entry_list>];
<HBA_index>          := LPFC HBA number
<ID_type>            := WWPN | WWNN | DID wwpn |wwnn |did
<binding_entry>      := "<target_ID>:<SCSI_ID>[<lun_mask_list>]"
<target_ID>          := Type dependent ID, 16 hex digits for WWPN and
                        WWNN, 6 hex digits for DID
<SCSI_ID>            := 0 thru 511
<lun_mask_list>      := {<LUN_ID>[,<LUN_ID_list>]}This lists LUNs to
                        be temporarily disabled.
<LUN_ID>             := First Level LUN ID (i.e. 0x4008, 5, or 17). Hex
                        numbers must be preceded with a leading '0x'.
                        If the target is in Volume Set Addressing (VSA)
                        mode, the LUN ID can be in VSA format or normal
                        logical number format(i.e. 0x4008 or 8).
<LUN_ID_list>        := <LUN_ID>[,LUN_ID_LIST>]
<binding_entry_list>:= <binding_entry>[,<binding_entry_list>]
```

Examples of binding-by-ID:

lpfc0-fcp-bind-WWNN="2000123456789abc:0","20000020370c27f7:3","20000020370c27f8:2";

lpfc1-fcp-bind-WWPN="2100123456789abc:10","21000020370c2856:11","21000020370c2855:12";

lpfc2-fcp-bind-DID="0000ef:3","0000fe:4","0000ee:5";

lpfc0-fcp-bind-DID="0000e1:81","0000e2:82","0000e4:83","0000e8:84{3,4,5}";

Example of binding-by-ID with spaces, tabs or new lines

```
lpfc0-fcp-bind-WWNN = "2000123456789abc:0",
                      "20000020370c27f7:3",
                      "20000020370c27f8:2";
```

Note: Use the "cat /dev/lpfc2" command to verify the bound SCSI ID.

Bind-by-Name Specifics

Neither HBA index numbers nor SCSI IDs are required to persistently bind-by-name. The bind-by-name method binds symbolic names to FC devices instead of the traditional HP-UX device filename c*X*tY*d*Z. This method hides all OS specific and HBA connectivity information. You only need to specify the symbolic name and the unique ID of the target. Each time the system reboots, the driver will ensure the correct mapping of FC devices with these symbolic names. Binding-by-name allows you to specify targets with different ID types. For example, if you have six targets, you can specify one target using fcp-bind-WWPN, two targets using fcp-bind-WWNN, and three targets using fcp-bind-DID. Each entry contains a separate set of targets.

Note: D_IDs must be unique within the system.

Although the symbolic names are persistent, the traditional device files which bind dynamically to these symbolic names may not be persistent if the configuration has changed.

Prerequisites

Gather the following information before you bind-by-ID:

- The target's unique ID & ID type.
- The unique name assigned to the target (an alphanumeric string up to 32 characters).
- Any non-default value(s) for target-specific configuration parameter(s).
- Any LUNs within the target which need to be temporarily hidden (blocked).

Syntax Rules

Follow these rules when persistent binding:

- Terminate all complete binding statements with semicolons (;).
- Spaces, tabs, or new lines are allowed between binding entries.

Syntax

```
fcp-bind-<ID_type>=<binding_entry>[,<binding_entry_list>];

       <ID_type>            := WWPN | WWNN | DID | wwpn | wwnn |did
       <binding_entry>      := "<target_ID>:<Target_name>[<lun_mask_list>]
                               [<tgt_spec_param_list>]"
       <target_ID>          := Type-dependent ID, 16 hex digits for WWPN and
                               WWNN, 6 hex digits for DID
       <Target_name>        := Alphanumeric string (up to 32 characters)
       <lun_mask_list>      := {<LUN_ID>[,<LUN_ID_list>]}This lists LUNs to
                               be temporarily disabled.
       <LUN_ID_list>        := <LUN_ID>[,<LUN_ID_LIST>]this lists LUNs to be
                               temporarily disabled.
       <LUN_ID>             := First Level LUN ID (i.e. 0x4008, 5, or 17). Hex
                               numbers must be preceded with leading '0x'. If
                               the target is in (Volume Set Addressing) VSA
                               mode, the LUN ID can be in VSA format or normal
                               logical number format (i.e. 0x4008 or 8).
       <LUN_ID_list>        := <LUN_ID>[,<LUN_ID_LIST>]
       <tgt_spec_param_list>  := <tgt_spec_param> [:<tgt_spec_param>]
       <tgt_spec_param>     := <param_name>=value
       <param_name >        := tgt-queue-depth | lun-queue-depth
       <binding_entry_list>:= <binding_entry> [,<binding_entry_list>]
```

Examples of binding-by-name

fcp-bind-WWNN = "2000123456789abc:hpva7", "20000020370c27f7:TDK0", "20000020370c27f8:SONY0";

fcp-bind-wwpn = "2100123456789abc:hpva7", "21000020370c2856:TDK0", "20000020370c2855:SONY0";

fcp-bind-DID = "0102ef:hpva7{0x4002,0x4005,0x4007}", "0102fe:hpva9", "0102ee:TDK9";

Example of binding-by-name with spaces, tabs or new lines

fcp-bind-WWNN = "2000123456789abc:hpva7",
"20000020370c27f7:TDK0",
"20000020370c27f8:SONY0";

Examples of various device files created from bind-by-name method

/dev/dsk/shark9.4008	block disk of LUN 0x4008 in diskarray shark9
/dev/rdsk/shark9.4008	raw disk of LUN 0x4008 in diskarray shark9
/dev/rmt/dds7.0000	LUN 0 of tape drive dds7
/dev/rmt/dds7.0000BESTn	LUN 0 of tape drive dds with best block density and no rewind option
/dev/ac/SONYac7.0000	controller for autochanger SONYac7
/dev/rac/SONYac7.0000s8	raw disk for surface #8 of autochanger SONYac7

Modify tgt-queue-depth and lun-que-depth Parameters in the Binding Entry

'tgt-queue-depth' and 'lun-queue-depth' are two target-specific configuration parameters. To set either of these parameters, add an appropriate argument at the end of the binding entry.

Example

fcp-bind-DID = "0102ef:hpva7{0x4002,0x4005,0x4007}:tgt-queue-depth=30:lun-queue-depth=10",

"0102fe:hpva9:tgt-queue-depth=40:lun-queue-depth=20",

"0102ee:TDK9";

Bind-by-Name-&-ID Specifics

This binding method combines the benefits of binding-by-ID and binding-by-name. The bind-by-name-&-ID method adds the field <HwPath_ID> between the <Target_ID> and <Target_name> of bind-by-name method. The complete binding entry and <HwPath_ID> have the following syntax:

```
<binding_entry> :=
"<Target_ID>:<HwPath_ID>:<Target_name>[<lun_mask_list>][:<tgt_spec_param_list>]"
<HwPath_ID>:= lpfcNNtXXX   NN - HBA number (up to two decimal digits)
                                XXX - SCSI ID 0-511
```

Setting Up LUN Blocking

LUN blocking enables you to mask out specific LUNs seen by each initiator. Once you know the device number for an HBA, you can create the FCP binding entries with LUN blocking to set up your configuration.

Example of binding on a device ID for four targets

```
lpfc0-fcp-bind-DID=
 "0000e1:1{2,4,6}",    # Block luns 2,4,6,
 "0000e2:255",
 "0000e4:256",
 "0000e8:511";
```

Interpreting the Hardware Path by IOSCAN

Run the IOScan command to view hardware paths and binding information. See Figure 1 for a sample output.

```
# ioscan -fnC disk
```

The hardware path of a LUN in Emulex's lpfc software consists of three components.

- FC HBA ID - The hardware paths of the Emulex FC HBA that go with the connected FC device (e.g. 10/1/8/0).
- FC DEVICE ID - The ID assigned to this FC device. This ID is represented by two levels of hardware paths. (e.g. "0.22" for ID 22). The driver can assign these IDs automatically based on the default setting in the lpfc configuration file (/opt/lpfc/conf/lpfc.conf), or you can specify a unique ID for this device based on the device's WWPN, WWNN, or D_ID via the lpfc-bind-WWPN, lpfc-bind-WWNN, or lpfc-bind-DID command in the lpfc configuration file.

- FC LUN ID - The remaining hardware paths denote the LUN number in the FC device. If the LUNs are configured in Volume Set Addressing (VSA) mode, these LUNs map to a set of sequential LUNs. The map is available via "cat /dev/lpfc2" command. It is also available in the file lunmap under /opt/lpfc/conf directory. The format of the paths is "D.T.L".
    - D denotes the sequence ID of the group of 128 LUNs. It is also the sequence ID of the Emulex pseudo HBA (from 0 to 7);
    - T denotes the SCSI ID of the target of the LUN (from 0 to 15);
    - L denotes the SCSI ID of the LUN where (from 0 to 7) the FC LUN number is calculated ((D*128)+(T*8)+L).

Note: Because of the number of LUNs available on a storage array, a translational scheme must be implemented by the Emulex driver to work around these limitations:

- 8 LUNs per target: workaround is every 8 LUNs constitute a pseudo target.
- 16 targets per HBA - workaround is every 16 pseudo targets constitute a pseudo HBA (“lpfd”). Consequently every 16*8 LUNs (128) constitute a pseudo HBA. The actual FC LUN is a combination of a pseudo HBA + a pseudo target + remaining LUNs.

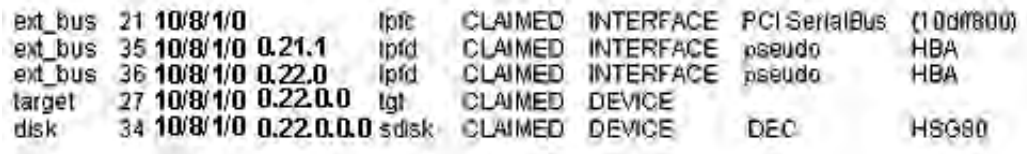
ext_bus 21 10/8/1/0 lpfc CLAIMED INTERFACE PCI SerialBus (10dff800)
ext_bus 35 10/8/1/0 0.21.1 lpfd CLAIMED INTERFACE pseudo HBA
ext_bus 36 10/8/1/0 0.22.0 lpfd CLAIMED INTERFACE pseudo HBA
target 27 10/8/1/0 0.22.0.0 tgt CLAIMED DEVICE
disk 34 10/8/1/0 0.22.0.0.0 sdisk CLAIMED DEVICE DEC HSG80

Figure 1: Sample IOSCAN report

Use the following table to help determine the SCSI ID and the actual LUN number for output scans generated by the -fnC disk command:

Parent lpfc Adapter	SCSI ID Offset Values: 0 or 1. If 0, the SCSI ID is determined by adding 0 to the SCSI Index. If 1, the SCSI ID is determined by adding 256 to the calculated SCSI LUN number.	Actual SCSI Device ID Use this number with the SCSI ID Offset to determine the SCSI ID.	Pseudo HBA (Bank of 128 LUNs) Values: 0 or 1. If 0, add 0 to the LUN Index to determine the actual LUN number. If 1, add 128 to the LUN Index to determine the actual LUN number.	Pseudo Target ID Used with the LUN Value to determine the LUN Index. LUN Index = ((Target ID) x 8) + (LUN Value)	LUN Value Used with the Target ID to determine the LUN Index. LUN Index = ((Target ID) x 8) + (LUN Value)	
10/1/8/0	.0	.22	.0	.0	.0	

Figure 2: The SCSI ID and LUN Number table

FC LUN = ((D*128)+(T*8)+L)

D - sequence ID of the group of 128 LUNs. Also the sequence ID of the Emulex pseudo HBA (0 - 1)

T - SCSI ID of the target of the LUN (0 - 15)

L - SCSI ID of the LUN where (0 - 7)

Example of Hardware Address after Binding

Hardware address: 10/1/8/0.0.22.0.2.7

SCSI ID = SCSI Offset + SCSI Index = 0 + 22 = 22 (Target number is 22)

The hardware address results from binding 000e8:22

.0	.22	.0	.2	.7
Bank of 256	Target ID	Bank of 128	# of LUNs/8	Remainder of LUNs/8
0 x 256		0x128+2x8+7		
16 + 7 = 23				
target # = 22; LUN # = 23				

IOScans for All Devices

To view hardware paths and binding information for all devices:

```
# ioscan -fnk
```

Examples of Device Files Created After a Module Reload

- For a JBOD named 'JBOD7' and diskarrays named 'HITACHI-012' and 'MSA1000', the device files /dev/[r]dsk/JBOD7.NNNN, /dev/[r]dsk/ HITACHI-012.NNNN and /dev/[r]dsk/ MSA1000.NNNN will be created respectively. The [r]dsk denotes SCSI disk driver rdsk and dsk, and NNNN represents LUNs configured in the targets and each NNNN is a four hex digits number.
- For a tape drive named 'EXABYTE-001', the device file /dev/rmt/EXABYTE-001.0000BEST and filenames with other density and rewind options will be created.

You do not need to figure out the mapping between cXtYdZ and actual LUNs.

Sample IOScan Report from No Binding

ext_bus	4	0/2/1/0	lpfc	CLAIMED	INTERFACE	PCI-X SerialBus (10dff980)
ext_bus	7	0/2/1/0.0.1.0	lpfd	CLAIMED	INTERFACE	Pseudo HBA
target	6	0/2/1/0.0.1.0.0	tgt	CLAIMED	DEVICE	
disk	13	0/2/1/0.0.1.0.0.0	sdisk	CLAIMED	DEVICE	HITACHI OPEN-3
		/dev/dsk/c7t0d0	/dev/rdsk/c7t0d0			
disk	14	0/2/1/0.0.1.0.0.1	sdisk	CLAIMED	DEVICE	HITACHI OPEN-3
		/dev/dsk/c7t0d1	/dev/rdsk/c7t0d1			
disk	15	0/2/1/0.0.1.0.0.2	sdisk	CLAIMED	DEVICE	HITACHI OPEN-3
		/dev/dsk/c7t0d2	/dev/rdsk/c7t0d2			
disk	16	0/2/1/0.0.1.0.0.3	sdisk	CLAIMED	DEVICE	HITACHI OPEN-3
		/dev/dsk/c7t0d3	/dev/rdsk/c7t0d3			
disk	25	0/2/1/0.0.1.0.1.4	sdisk	CLAIMED	DEVICE	HITACHI OPEN-3
		/dev/dsk/c7t1d4	/dev/rdsk/c7t1d4			
disk	26	0/2/1/0.0.1.0.1.5	sdisk	CLAIMED	DEVICE	HITACHI OPEN-3
		/dev/dsk/c7t1d5	/dev/rdsk/c7t1d5			
ext_bus	8	0/3/1/0	lpfc	CLAIMED	INTERFACE	PCI-X SerialBus (10dffa00)
ext_bus	10	0/3/1/0.0.20.0	lpfd	CLAIMED	INTERFACE	Pseudo HBA
target	8	0/3/1/0.0.20.0.0	tgt	CLAIMED	DEVICE	
tape	0	0/3/1/0.0.20.0.0.0	stape	CLAIMED	DEVICE	EXABYTE Mammoth2
		/dev/rmt/1m		/dev/rmt/1mb		
		/dev/rmt/1mn		/dev/rmt/1mnb		
		/dev/rmt/c10t0d0D3590		/dev/rmt/c10t0d0D3590b		

/dev/rmt/c10t0d0D3590n /dev/rmt/c10t0d0D3590nb
/dev/rmt/c10t0d0BEST /dev/rmt/c10t0d0BESTb
/dev/rmt/c10t0d0BESTn /dev/rmt/c10t0d0BESTnb

Sample IOScan Report from Bind-by-ID

fcp-bind-wwpn="<hiatch_array_16_hex_digits_wwpn>:88";
ioscan -fnk

ext_bus	4	0/2/1/0	lpfc	CLAIMED	INTERFACE	PCI-X SerialBus (10dff980)
ext_bus	7	0/2/1/0.0.88.0	lpfd	CLAIMED	INTERFACE	Pseudo HBA
target	6	0/2/1/0.0.88.0.0	tgt	CLAIMED	DEVICE	
disk	13	0/2/1/0.0.88.0.0.0	sdisk	CLAIMED	DEVICE	HITACHI OPEN-3
		/dev/dsk/c7t0d0	/dev/rdsk/c7t0d0			
disk	14	0/2/1/0.0.88.0.0.1	sdisk	CLAIMED	DEVICE	HITACHI OPEN-3
		/dev/dsk/c7t0d1	/dev/rdsk/c7t0d1			
disk	15	0/2/1/0.0.88.0.0.2	sdisk	CLAIMED	DEVICE	HITACHI OPEN-3
		/dev/dsk/c7t0d2	/dev/rdsk/c7t0d2			
disk	16	0/2/1/0.0.88.0.0.3	sdisk	CLAIMED	DEVICE	HITACHI OPEN-3
		/dev/dsk/c7t0d3	/dev/rdsk/c7t0d3			
disk	25	0/2/1/0.0.88.0.1.4	sdisk	CLAIMED	DEVICE	HITACHI OPEN-3
		/dev/dsk/c7t1d4	/dev/rdsk/c7t1d4			
disk	26	0/2/1/0.0.88.0.1.5	sdisk	CLAIMED	DEVICE	HITACHI OPEN-3
		/dev/dsk/c7t1d5	/dev/rdsk/c7t1d5			
ext_bus	8	0/3/1/0	lpfc	CLAIMED	INTERFACE	PCI-X SerialBus (10dffa00)
ext_bus	10	0/3/1/0.0.20.0	lpfd	CLAIMED	INTERFACE	Pseudo HBA
target	8	0/3/1/0.0.20.0.0	tgt	CLAIMED	DEVICE	
tape	0	0/3/1/0.0.20.0.0.0	stape	CLAIMED	DEVICE	EXABYTE Mammoth2
		/dev/rmt/1mn		/dev/rmt/c10t0d0D3590		
		/dev/rmt/1mnb		/dev/rmt/c10t0d0D3590b		
		/dev/rmt/c10t0d0BEST		/dev/rmt/c10t0d0D3590n		
		/dev/rmt/c10t0d0BESTb		/dev/rmt/c10t0d0D3590nb		
		/dev/rmt/1m		/dev/rmt/c10t0d0BESTn		
		/dev/rmt/1mb		/dev/rmt/c10t0d0BESTnb		

Sample IOScan Report from Bind-by-Name

```
fcp-bind-wwpn="<hitachi_array_16_hex_digits_wwpn>:HITACHI",
                "<exabyte_tape_drive_16_hex_digits_wwpn>:EXABYTE";
# ioscan -fnk

ext_bus    4    0/2/1/0                lpfc    CLAIMED    INTERFACE    PCI-X SerialBus
                                                                        (10dff980)
ext_bus    7    0/2/1/0.0.1.0          lpfd    CLAIMED    INTERFACE     Pseudo HBA
target     6    0/2/1/0.0.1.0.0        tgt     CLAIMED    DEVICE
disk       13   0/2/1/0.0.1.0.0.0      sdisk   CLAIMED    DEVICE       HITACHI OPEN-3
                    /dev/dsk/HITACHI.0000      /dev/dsk/c7t0d0
                    /dev/rdsk/HITACHI.0000     /dev/rdsk/c7t0d0
disk       14   0/2/1/0.0.1.0.0.1      sdisk   CLAIMED    DEVICE       HITACHI OPEN-3
                    /dev/dsk/HITACHI.0001      /dev/dsk/c7t0d1
                    /dev/rdsk/HITACHI.0001     /dev/rdsk/c7t0d1
disk       15   0/2/1/0.0.1.0.0.2      sdisk   CLAIMED    DEVICE       HITACHI OPEN-3
                    / dev/dsk/HITACHI.0002     /dev/dsk/c7t0d2
                    / dev/rdsk/HITACHI.0002    /dev/rdsk/c7t0d2
disk       16   0/2/1/0.0.1.0.0.3      sdisk   CLAIMED    DEVICE       HITACHI OPEN-3
                    /dev/dsk/HITACHI.0003      /dev/dsk/c7t0d3
                    /dev/rdsk/HITACHI.0003     /dev/rdsk/c7t0d3
                              :
                              :
                              :
disk       25   0/2/1/0.0.1.0.1.4      sdisk   CLAIMED    DEVICE       HITACHI OPEN-3
                     /dev/dsk/HITACHI.000c       /dev/dsk/c7t1d4
                     /dev/rdsk/HITACHI.000c      /dev/rdsk/c7t1d4
disk       26   0/2/1/0.0.1.0.1.5      sdisk   CLAIMED    DEVICE       HITACHI OPEN-3
                    /dev/dsk/HITACHI.000d   /dev/dsk/c7t1d5
                    /dev/rdsk/HITACHI.000d  /dev/rdsk/c7t1d5
ext_bus    8    0/3/1/0                lpfc    CLAIMED    INTERFACE    PCI-X SerialBus
                                                                        (10dffa00)
ext_bus    10   0/3/1/0.0.20.0          lpfd    CLAIMED    INTERFACE    Pseudo HBA
target     8    0/3/1/0.0.20.0.0       tgt     CLAIMED    DEVICE
tape       0    0/3/1/0.0.20.0.0.0     stape   CLAIMED    DEVICE       EXABYTE Mammoth2
                 /dev/rmt/EXABYTE.0000BEST       /dev/rmt/1mn              /dev/rmt/c10t0d0D3590
                 /dev/rmt/EXABYTE.0000BESTb      /dev/rmt/1mnb             /dev/rmt/c10t0d0D3590b
                 /dev/rmt/EXABYTE.0000BESTn      /dev/rmt/c10t0d0BEST   /dev/rmt/c10t0d0D3590n
                 /dev/rmt/EXABYTE.0000BESTnb     /dev/rmt/c10t0d0BESTb  /dev/rmt/c10t0d0D3590nb
```

/dev/rmt/1m /dev/rmt/c10t0d0BESTn

/dev/rmt/1mb /dev/rmt/c10t0d0BESTnb

Sample IOScan Report from Bind-by-Name-&-ID

fcp-bind-wwpn="<hitachi_array_16_hex_digits_wwpn>:lpfc0t88:HITACHI",

"<exabyte_tape_drive_16_hex_digits_wwpn>:lpfc0t99:EXABYTE";

ext_bus 4 0/2/1/0 lpfc CLAIMED INTERFACE PCI-X SerialBus (10dff980)

ext_bus 7 0/2/1/0.0.88.0 lpfd CLAIMED INTERFACE Pseudo HBA

target 6 0/2/1/0.0.88.0.0 tgt CLAIMED DEVICE

disk 13 0/2/1/0.0.88.0.0.0 sdisk CLAIMED DEVICE HITACHI OPEN-3

/dev/dsk/HITACHI.0000 /dev/dsk/c7t0d0

/dev/rdsk/HITACHI.0000 /dev/rdsk/c7t0d0

disk 14 0/2/1/0.0.88.0.0.1 sdisk CLAIMED DEVICE HITACHI OPEN-3

/dev/dsk/HITACHI.0001 /dev/dsk/c7t0d1

/dev/rdsk/HITACHI.0001 /dev/rdsk/c7t0d1

disk 15 0/2/1/0.0.88.0.0.2 sdisk CLAIMED DEVICE HITACHI OPEN-3

/ dev/dsk/HITACHI.0002 /dev/dsk/c7t0d2

/ dev/rdsk/HITACHI.0002 /dev/rdsk/c7t0d2

disk 16 0/2/1/0.0.88.0.0.3 sdisk CLAIMED DEVICE HITACHI OPEN-3

/dev/dsk/HITACHI.0003 /dev/dsk/c7t0d3

/dev/rdsk/HITACHI.0003 /dev/rdsk/c7t0d3

:

:

:

disk 25 0/2/1/0.0.88.0.1.4 sdisk CLAIMED DEVICE HITACHI OPEN-3

/dev/dsk/HITACHI.000c /dev/dsk/c7t1d4

/dev/rdsk/HITACHI.000c /dev/rdsk/c7t1d4

disk 26 0/2/1/0.0.88.0.1.5 sdisk CLAIMED DEVICE HITACHI OPEN-3

/dev/dsk/HITACHI.000d /dev/dsk/c7t1d5

/dev/rdsk/HITACHI.000d /dev/rdsk/c7t1d5

ext_bus 8 0/3/1/0 lpfc CLAIMED INTERFACE PCI-X SerialBus (10dffa00)

ext_bus 10 0/3/1/0.0.99.0 lpfd CLAIMED INTERFACE Pseudo HBA

target 8 0/3/1/0.0.99.0.0 tgt CLAIMED DEVICE

tape 0 0/3/1/0.0.99.0.0.0 stape CLAIMED DEVICE EXABYTE Mammoth2

/dev/rmt/EXABYTE.0000BEST /dev/rmt/1mn /dev/rmt/c10t0d0D3590

/dev/rmt/EXABYTE.0000BESTb /dev/rmt/1mnb /dev/rmt/c10t0d0D3590b

/dev/rmt/EXABYTE.0000BESTn	/dev/rmt/c10t0d0BEST	/dev/rmt/c10t0d0D3590n
/dev/rmt/EXABYTE.0000BESTnb	/dev/rmt/c10t0d0BESTb	/dev/rmt/c10t0d0D3590nb
/dev/rmt/1m	/dev/rmt/c10t0d0BESTn	
/dev/rmt/1mb	/dev/rmt/c10t0d0BESTnb	

Understanding Device Numbering

There are two levels of device numbering. When the driver is configured, various configuration parameters rely upon device numbers.

The first level of device numbering is the driver instance number. This number appears in log messages to syslog or the console, for example: lpfc**X**. The configuration parameters in lpfc.conf that use lpfc**X** rely on **X** to be the driver instance number. In systems where HBAs are moved around or changed, it is possible for the driver instance number to exceed the number of HBAs.

The second level of numbering is the SCSI controller number. This number is assigned by the system for each pseudo HBA driver it detects. It is typically located in the special files that are created to access each SCSI device: for example, /dev/dsk/c**Z**t0d0s2.

Maintenance Utility - lputil

Starting lputil

lputil is installed automatically when you install the driver.

Start the utility by entering the complete path to lputil at the command prompt. The path reflects the default installation path. If the installation path changed, you must adjust the command appropriately.

To start lputil type:

```
/opt/lpfc/bin/lputil
```

HBAs are listed. For example:

```
LightPulse Common Utility for HPUX Version 2.0a9 (8/4/2005)
Copyright (c) 2005, Emulex Corporation

Emulex Fibre Channel Host Adapters Detected: 6
Host Adapter 0 (lpfc0) is an LP11002 (Ready Mode)
Host Adapter 1 (lpfc1) is an LP11002 (Ready Mode)
Host Adapter 2 (lpfc2) is an LP10K (Ready Mode)
Host Adapter 3 (lpfc3) is an LP9802 (Ready Mode)
Host Adapter 4 (lpfc4) is an LP11002 (Ready Mode)
```

`Host Adapter 5 (lpfc5) is an LP11002 (Ready Mode)` lputil starts and the Main menu appears.

Figure 3: The lputil Main Menu

The following table describes the lputil Main menu options:

Table 5: lputil Main Menu Options

Menu Selection	Description
1. List Adapters	Shows a list of HBAs discovered in the system.
2. Adapter Information	Shows HBA characteristics such as: PCI configuration parameters, HBA revision levels, wakeup parameters, IEEE address, loop map, status and counters, link status and HBA configuration parameters.
3. Firmware Maintenance	Use this option to upgrade firmware. Acceptable file formats are: absolute firmware image (.all), program image (.prg), and download with checksum (.dwc). Each file is hardware specific (LP11000, etc.).
3. Reset Adapter	Use this option during troubleshooting to isolate one HBA from other installed HBAs. In most cases, the upgrade procedure performs an automatic restart of the HBA.

Listing Adapters

When you start the LightPulse Utility (lputil), all adapters in the system are listed with information such as the host adapter number, instance number (i.e. lpfc0), board model type, whether it is a standard or non-standard device and whether the adapter is ready to use.

To list adapters:

1. Start lputil by entering the complete path at the command prompt. The path in the example reflects the default installation path. If the installation path has changed, adjust the command appropriately.

   ```
   /opt/lpfc/bin/lputil
   ```

2. From the Main menu, enter 1, List Adapters.

Figure 4: The lputil Main Menu

Viewing Adapter Information

lputil enables you to view information for a selected adapter.

To view adapter information:

1. Start the utility by entering the complete path at the command prompt. The path in the example reflects the default installation path. If the installation path has changed, adjust the command appropriately.

   ```
   /opt/lpfc/bin/lputil
   ```

   The Main menu appears:

Figure 5: The lputil Main Menu

2. Select choice #2. If you have multiple adapters, a list appears. Select an HBA and the Adapter Information Menu appears. If you have only one HBA, the Adapter Information Menu displays information for that HBA.

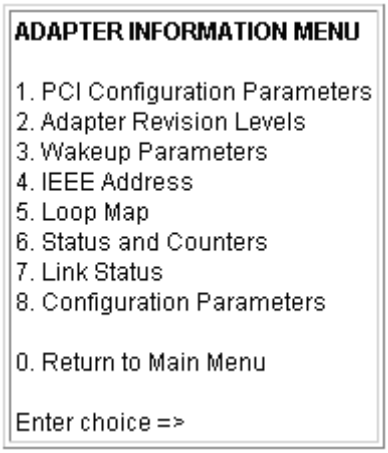

Figure 6: The Iputil Adapter Information Menu

3. Enter the menu item number of the information you wish to view.

Adapter Information Menu options

The Adapter Information Menu enables you to view the following information:

- **PCI Configuration Parameters** - parameters from the PCI configuration on the adapter. Examples of this information include vendor ID, device ID, base addresses, ROM address, header type, subclass and base class.
- **Adapter Revision Levels** - firmware revision levels, including kernel and overlay version information.
- **Wakeup Parameters** - the BIOS status and version, as well as SLI (service level interface).
- **IEEE Address** - the HBA address.
- **Loop Map** - If you use arbitrated loop topology, this menu option shows information about connected devices, such as AL_PA and D_ID.
- **Status and Counters** - tracks such activities as link failure, loss synch and elastic overlay.
- **Link Status** - the link status of the selected adapter.
- **Configuration Parameters** - parameters such as link failure count, loss sync count and timeout.

Updating Firmware

Prerequisites

- The driver for HP-UX is installed properly.
- The firmware file is downloaded to a local drive. Firmware versions differ between adapter versions. Make sure you have downloaded the appropriate firmware for your adapter.
- I/O activity on the bus is quieted.
- Any software that relies on the HBA to be available has been stopped or paused.

Procedure

This procedure uses the lputil utility, which is automatically installed with the driver.

Caution: Once a download has started, do not interrupt the process until the download is complete. If you interrupt this process, the HBA may be rendered inoperable.

To update firmware:

1. If possible, stop all I/O to the HBA.
2. Start the utility by entering the complete path to lputil at the command prompt. The path in the example reflects the default installation path. If the installation path has changed, adjust the command appropriately.

   ```
   /opt/lpfc/bin/lputil
   ```
3. From the Main menu, enter 3, Firmware Maintenance.
4. If prompted, select the HBA you want to update.
5. Enter 1, Load Firmware Image.
6. Enter the full path to the firmware file.

   The new firmware transfers to flash ROM.

   To update firmware on a dual-channel HBA, repeat steps 3 through 5 to update the firmware on the second port.

Resetting an Adapter

Caution: If possible, stop HBA I/O before updating firmware or resetting the HBA.

lputil enables you to reset the HBA.

To reset an HBA:

1. Stop all I/O to the HBA.
2. Start the utility by entering the complete path to lputil at the command prompt. The path in the example reflects the default installation path. If the installation path has changed, adjust the command appropriately.

   ```
   /opt/lpfc/bin/lputil
   ```

   Once you start the utility, the Main Menu appears:

3. The lputil Main Menu

Select 4, Reset Adapter. Resetting an HBA causes self tests to run and reestablishes links (causing discovery of devices). Once the HBA has successfully reset, the Main Menu appears.

If you have multiple HBAs, a list shows that enables you to select the HBA you want to reset.

Downloading PCI Configuration

Note: Only select this option if you are familiar with PCI configuration registers.

To download the PCI Configuration:

1. Start the utility by entering the complete path to lputil at the command prompt. The path in the example reflects the default installation path. If the installation path has changed, adjust the command appropriately.

   ```
   /opt/lpfc/bin/lputil
   ```

2. From the Main menu, Select 3, Firmware Maintenance. The Firmware Maintenance menu appears.

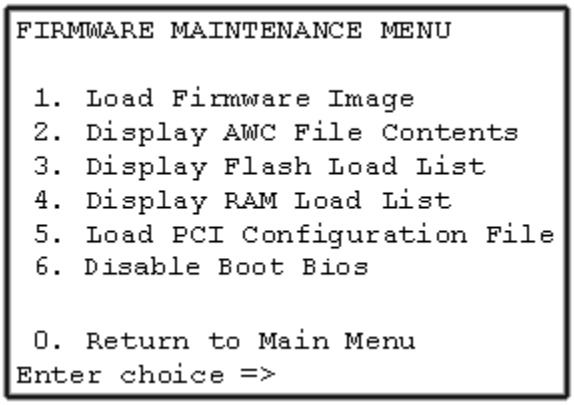
FIRMWARE MAINTENANCE MENU
1. Load Firmware Image
2. Display AWC File Contents
3. Display Flash Load List
4. Display RAM Load List
5. Load PCI Configuration File
6. Disable Boot Bios
0. Return to Main Menu
Enter choice =>

Figure 7: The lputil Firmware Maintenance Menu

3. Select 5, Load PCI Configuration File. PCI configuration data is contained in .cfl files, which can be used across any supported platform.
4. Enter the region in Flash ROM to download the data and press <Enter>.

   You can download one of three data sets for the PCI configuration registers:

   - Default PCI Configuration Region
   - PCI Configuration Region 1
   - PCI Configuration Region 2

5. Upon completion, press 0 to return to Main menu.
6. Press 0 to exit the utility.
7. Power down the system.
8. Restart the system to load the new configuration data.

Using the lputil Command Line Interface

The lputil command line options enable you to perform lputil tasks if you have a non-interactive application, such as a shell script.

Table 6: lputil Commands

Command	Effect
version	Shows the lputil version.
listhbas	Shows HBA number, WWNN and WWPN.
download <*adapter-number*><*image-name*>	Use this option to upgrade firmware. Acceptable file formats: absolute firmware image (.all), program image (.prg), and download with checksum (.dwc). Each file is hardware specific (LP11000, etc.).
count	Shows the number of discovered HBAs.
rev <*adapter-number*>	Shows the following information: • BIU - bus interface unit number • Sequence Manager • Endec • Operational Firmware • Kernel • Initial Firmware: Initial firmware version number • SLI-1 - the name of the SLI-1 firmware overlay • SLI-2 - the name of the SLI-2 firmware overlay • Highest FC-PH Version • Lowest FC-PH Version
model <*adapter-number*>	Shows the current HBA model.
showpci <*adapter-number*>	Shows the following information: • Vendor ID • Device ID - the HBA's default device ID • Command • Status • Revision • ProgIf • SubClass • BaseClass • CacheLine • Latency • HeaderType • BIST: • Base Address information • ROM Address • CIS • SubVendor ID • SubSystem ID • Interrupt Line • Interrupt Pin

Table 6: lputil Commands (Continued)

Command	Effect
status <*adapter-number*>	Shows the following information: • Active RPI Count: • Active XRI Count: • Xmit Byte Count: bytes transmitted by this HBA port • Rcv Byte Count - bytes received by this HBA port • Xmit Frame Count - FC frames transmitted by this HBA port • Rcv Frame Count - FC frames received by this HBA port • Xmit Seq Count - FC sequences transmitted by this HBA port • Rcv Seq Count: FC sequences received by this HBA port • Total Orig Xchgs - the total number of transmissions by this HBA port • Total Resp Xchgs: the number of FC exchange responses made by this port Rcv PBSY Count Rcv FBSY Count
linkstat <*adapter-number*>	Shows the following information: • Link failure count - the number of times the link failed. A link failure may cause a timeout. • Loss sync count - the number of times loss of synchronization has occurred. • Loss signal count - the signal loss error count. This counter increments on each lost signal. • Prim seq err count - the primitive sequence protocol error count. This counter increments upon any type of protocol error. • Invalid xmit word - the total number of invalid words transmitted by this HBA port. • CRC count - the cyclic redundancy check count. This counter increments when the data stored or transmitted failed to arrive as sent. • Prim seq timeout - the primitive sequence protocol error count. This counter increments with any type of protocol error. • Elastic overrun - the elastic buffer overrun algorithm. This counter increments when the algorithm detects a buffer overrun. • ARB timeout - the arbitrated loop timeout.

Table 6: lputil Commands (Continued)

Command	Effect
fwlist <*adapter-number*>	Shows the following information: • Test Program - the last diagnostic performed for the HBA • Functional Firmware - the Emulex firmware version number for this model of HBA • SLI-1 Overlay - the name of the SLI-1 firmware overlay • SLI-2 Overlay - the name of the SLI-1 firmware overlay
shownodes <*adapter-number*>	Shows node status, WWPN and WWNN for all visible nodes.
fcpmap <*adapter-number*>	Shows the following information: Num Entries - the number of discovered HBAs Portname - the unique 64-bit number, in hexadecimal, for the port Nodename - the unique 64-bit number, in hexadecimal, for the target Fcid 0xe4 FcpLun 0x0 Bus 0x0 Tgt 0x2 Lun 0x0 DeviceName - the operating system device name
lputil help	Shows a list of lputil commands. **Caution:** The difcode command is listed in lputil help. This command is for SBUS systems only. If the difcode command is invoked on a non-SBUS system, the HBA may be rendered inoperable.

Examples of lputil Commands

version

```
reddog:B.11.11:root[/] lputil version
2.0.a.9
```

listhbas

```
reddog:B.11.11:root[/] lputil listhbas

WWNN                            WWPN                            Board
=============================================================================
20:00:00:00:c9:23:78:3f         10:00:00:00:c9:23:78:3f           0
```

count

```
reddog:B.11.11:root[/] lputil count
1
```

download

```
reddog:B.11.11:root[/] lputil download

Opening File...
Reading Header...
Validating Checksum...
Initializing Host Adapter...
Erasing Flash ROM Sectors...
100% complete
Loading Image...
100% complete
Updating Wakeup Parameters...
Resetting Host Adapter...
Image Successfully Downloaded
```

rev

```
reddog:B.11.11:root[/] lputil rev 0

                   BIU: 2002506D
       Sequence Manager: 00000000
                  Endec: 00000000
  Operational Firmware: SLI-2 Overlay
                Kernel: LP8K 2.10a3
       Initial Firmware: Initial Load 3.90a7 (DS3.90A7 )
                  SLI-1: LP8K SLI-1 Overlay 3.90a7 (D1D3.90A7 )
                  SLI-2: LP8K SLI-2 Overlay 3.90a7 (D2D3.90A7 )
 Highest FC-PH Version: 4.3
  Lowest FC-PH Version: 4.3
```

model

```
reddog:B.11.11:root[/] lputil model 0
LP8K_V2
```

showpci

```
reddog:B.11.11:root[/] lputil showpci 0
             Vendor ID: 10DF
             Device ID: F800
               Command: 0157
                Status: 0280
              Revision: 02
                ProgIf: 00
              SubClass: 04
             BaseClass: 0C
             CacheLine: 08
               Latency: F8
            HeaderType: 00
                  BIST: 00
        Base Address 0: F2FFB004
        Base Address 1: 00000000
        Base Address 2: F2FFC004
        Base Address 3: 00000000
        Base Address 4: 0000FD01
        Base Address 5: 00000000
           ROM Address: 00000000
                   CIS: 00000000
          SubVendor ID: 10DF
          SubSystem ID: F800
        Interrupt Line: 01
         Interrupt Pin: 01
```

status

```
reddog:B.11.11:root[/] lputil status 0

      Active RPI Count: 0000
      Active XRI Count: 0000
       Xmit Byte Count: 0000083E
        Rcv Byte Count: 000135F6
      Xmit Frame Count: 000096AC
       Rcv Frame Count: 00012D3D
        Xmit Seq Count: 000096AC
         Rcv Seq Count: 00012D3D
      Total Orig Xchgs: 000096A3
      Total Resp Xchgs: 0000000C
        Rcv PBSY Count: 00000000
        Rcv FBSY Count: 00000000
```

linkstat

```
reddog:B.11.11:root[/] lputil linkstat 0

    Link Failure Count: 00000001
       Loss Sync Count: 00000009
     Loss Signal Count: 00000000
    Prim Seq Err Count: 00000000
     Invalid Xmit Word: 00000004
             CRC Count: 00000000
      Prim Seq Timeout: 00000000
       Elastic Overrun: 00000000
           ARB Timeout: 00000000
```

fwlist

```
reddog:B.11.11:root[/] lputil fwlist 0

        1. Test Program: NLPort LoopBack
        2. Functional Firmware: DS3.90A7
        3. SLI-1 Overlay: D1D3.90A7
        4. SLI-2 Overlay: D2D3.90A7
```

shownodes

```
reddog:B.11.11:root[/] lputil shownodes 0

Visible Nodes:
Node               Target  WWPN                    WWNN
----               ------  ---------               --------
In Transition         0  10-00-00-00-c9-21-6b-11  20-00-00-00-c9-21-6b-11
In Transition            0  10-00-00-00-c9-2e-09-d3  20-00-00-00-c9-2e-09-d3
In Transition            0  10-00-00-00-c9-2e-50-df  20-00-00-00-c9-2e-50-df
In Transition            0  10-00-00-00-c9-23-23-77  20-00-00-00-c9-23-23-77
In Transition            0  10-00-00-00-c9-23-78-3f  20-00-00-00-c9-23-78-3f
Automapped FCP Node      2  50-06-09-46-70-40-11-d4  50-06-09-46-70-00-11-d4
Automapped FCP Node      1  50-00-00-00-00-40-00-e8  50-00-00-00-00-00-00-e8
```

fcpmap

```
reddog:B.11.11:root[/] lputil fcpmap 0
Num Entries 0x2
Portname: 50:06:09:46:70:40:11:d4
Nodename: 50:06:09:46:70:00:11:d4 Fcid 0xe4 FcpLun 0x0
Bus 0x0 Tgt 0x2 Lun 0x0 DeviceName lpfc:0:2:0
Portname: 50:00:00:00:00:40:00:e8
Nodename: 50:00:00:00:00:00:00:e8 Fcid 0xe8 FcpLun 0x0
Bus 0x0 Tgt 0x1 Lun 0x0 DeviceName lpfc:0:1:0
```

Troubleshooting

Introduction

There are several circumstances in which your system may operate in an unexpected manner. Table 7 explains some of these circumstances and offers one or more workarounds for each situation. The Error Code topic beginning on page 42 includes detail for both Platform Independent and HP-UX-specific errors.

General Situations and Resolutions

Table 7: General Situations

Situation	Resolution
During installation, the software agent reports one or more files cannot be found in depot package.	The software agent is very sensitive to TCP/IP configuration errors. Ensure that TCP/IP is properly configured. For example; ensure that the name service switch for hosts is properly configured and that the IP address and name in /etc/hosts is correct.
After the system loads, LVM defined file systems are not mounted. Non-LVM file systems are mounted.	On PA-RISC systems, the LVM module is loaded before the Emulex LPFC driver. See the section in /opt/lpfc/conf/lpfc.conf for using the "lpfc-rcinit" parameter and the example script to handle this situation. The "lpfc-rcinit" parameter can be used to activate (and mount if desired) the LVM defined file systems after the LPFC driver load. Additionally, this function will deactivate the LVM defined file systems, if the user desires, when the driver is manually unloaded.

Error Codes Table

Introduction

Error/warning messages are logged only into /var/adm/syslog/syslog.log file. Some messages are recorded only if the log-verbose configuration parameter is turned on. With the verbose parameter, you can set a bit mask to record specific types of verbose messages:

Severity Codes

Information and warning messages can be turned ON or OFF by setting/resetting the appropriate mask bit(s) in the variable 'lpfc_log_verbose' located in the driver configuration module, lpfc.conf.c. By default, both information and warning messages are disabled. Configuration error (c), error (e), and panic (p) messages can not be disabled.

Table 8: Severity Code Table

Code	Severity
0x1	ELS events
0x2	Device Discovery events
0x4	Mailbox Command events
0x8	Miscellaneous events
0x10	Link Attention events
0x20	IP events
0x40	FCP events
0x80	Node table events

Error messages are documented in the following format:

Lpfc**N**: **Num** : **Message**

Date: **Variables**

Where **N** is the interface number

Num is a unique error code and **Message** is the error title message

Variables are five possible message-dependent data variables.

- Error description.
- Message status (error, warning or panic), how the error is logged (always or verbose) and the driver source code location.
- Follow up action required (if any).

Platform Independent Errors (001 - 099)

lpfcN: 1: Stray ELS completion

DESCRIPTION: Received an ELS command completion without issuing a corresponding ELS command (based on the IOTAG field in the CMD_ELS_REQUEST_CR IOCB). The IOCB command and IOTAG are used to match are recorded.

LOG: ERROR always fcelsb.c

ACTION: This error could indicate a software driver or firmware problem. If the problems persist, report these errors to Technical Support.

lpfcN: 2: ELS [command response] completion error

DESCRIPTION: An ELS command completed with a status error in the IOCB. The IOCB command, IOCB status, IOCB parameter error, as well as the PortID this ELS command was directed to are recorded. This is only a warning. It could mean:

- The Fibre Channel device on the network is not responding.
- The Fibre Channel device is not an FCP target.

The Fibre Channel driver will automatically retry this ELS command if needed.

LOG: WARNING ELS verbose fcelsb.c

ACTION: If the ELS command is a PLOGI or PRLI, and the destination PortID is not an FCP target, no action is needed. Otherwise, check the physical connections to the Fibre Channel network and the state of the remote PortID.

lpfcN: 3: Device Discovery completion error

DESCRIPTION: This indicates that an uncorrectable error was encountered during device (re)discovery after a link up. Fibre Channel devices will not be accessible if this message is displayed. The location within the driver is recorded.

LOG: ERROR always fcelsb.c

ACTION: Reboot the system. If the problem persists, contact Technical Support. Run with verbose mode on for more details.

lpfcN: 4: Device Discovery completes

DESCRIPTION: This indicates successful completion of device (re)discovery after a link up. The location within the driver is recorded.

LOG: WARNING DISCOVERY verbose fcelsb.c

ACTION: none needed.

lpfcN: 5: Unknown ELS [command response iocb]

DESCRIPTION: An ELS command, ELS response, or ELS ring IOCB are not supported or have an illegal value. The illegal / unknown value is recorded.

LOG: ERROR always fcelsb.c

ACTION: This error could indicate a software driver or firmware problem. If problems persist report these errors to Technical Support.

lpfcN: 6: FARP-[REQ RSP] received

DESCRIPTION: A FARP ELS command was received from a Fabric. The command originator's PortID is recorded.

LOG: WARNING IP verbose fcelsb.c

ACTION: none needed.

lpfcN: 7: FLOGI completes successfully

DESCRIPTION: A Fabric Login completed successfully. The assigned PortID, R_A_TOV and E_D_TOV are recorded.

LOG: WARNING DISCOVERY verbose fcelsb.c

ACTION: none needed.

lpfcN: 8: PRLI completes successfully

DESCRIPTION: A PRLI to a FCP target completed successfully. target PortID and FCP SCSI ID (pan, sid) are recorded.

LOG: WARNING FCP / DISCOVERY verbose fcelsb.c

ACTION: none needed.

lpfcN: 9: FAN received

DESCRIPTION: A FAN ELS command was received from a Fabric. The assigned PortID and internal driver state are recorded.

LOG: WARNING FCP / DISCOVERY verbose fcelsb.c

ACTION: none needed.

lpfcN: 10: RSCN received

DESCRIPTION: A RSCN ELS command was received from a Fabric. The internal driver state and size of the RSCN payload is recorded

LOG: WARNING DISCOVERY verbose fcelsb.c

ACTION: none needed.

lpfcN: 11: Unknown Identifier in RSCN payload

DESCRIPTION: Typically the identifier in the RSCN payload specifies a domain, area or a specific N_Port ID. If neither of these are specified, a warning will be recorded. The value of the illegal identifier will be recorded.

LOG: WARNING always fcelsb.c

ACTION: Potential problem with Fabric. Check with Fabric vendor.

lpfcN: 12: ELS Retry failed

DESCRIPTION: If an ELS command fails, it may be retried up to 3 times. This message will be recorded if the driver gives up retrying a specific ELS command. The value of the ELS command and the Remote PortID will be recorded.

LOG: WARNING ELS verbose fcelsb.c

ACTION: If the ELS command is a PRLI, and the destination PortID is not an FCP Target, no action is needed. Otherwise, check physical connections to Fibre Channel network and the state the remote PortID is in.

lpfcN: 13: Service Level Interface selected

DESCRIPTION: Either a CONFIG_PORT (SLI2) or PART_SLIM (SLI1) mailbox command was issued. The SLI selected, 1 or 2, and the virtual address of the SLIM will be recorded.

LOG: WARNING MISC verbose fcmboxb.c

ACTION: none needed.

lpfcN: 14: Memory Buffer Pool is below low water mark

DESCRIPTION: A driver memory buffer pool is low on buffers. The buffer pool number and low water mark are recorded.

ACTION: none needed.

LOG: WARNING MISC verbose fcmemb.c

lpfcN: 15: Memory Buffer Pool is out of buffers

DESCRIPTION: A driver memory buffer pool is exhausted. The buffer pool number is recorded.

LOG: ERROR always fcmemb.c

ACTION: Configure more resources for that buffer pool. If problems persist report these errors to Technical Support.

lpfcN: 16: Cannot find virtual address for mapped buffer

DESCRIPTION: The driver cannot find the specified buffer in its mapping table. Thus is cannot find the virtual address needed to access the data. The mapped buffer address and ring number are recorded.

LOG: ERROR always fcmemb.c

ACTION: If problems persist report these errors to Technical Support.

lpfcN: 17: Ran out of Node Table entries

DESCRIPTION: The driver maintains a node table with one entry for every device it needs to communicate with on the Fibre Channel network. The number of table entries and the PortID for the device that failed are recorded. This message will be a warning / verbose if the driver can free up some unused node table entries.

LOG: ERROR always fcrpib.c

ACTION: Reduce the number of devices in your Fibre Channel network. If problems persist report these errors to Technical Support.

lpfcN: 18: Device Discovery Started

DESCRIPTION: Device discovery / rediscovery after FLOGI or FAN has started. The location within the driver is recorded.

LOG: WARNING DISCOVERY verbose fcrpib.

ACTION: none needed.

lpfcN: 19: Stray FCP Completion

DESCRIPTION: Received an FCP command completion without issuing a corresponding FCP Command (based on the iotag field in the FCP iocb). The IOCB command, IOCB status, IOCB parameter and iotag used to match are recorded.

LOG: ERROR always fcscsib.c

ACTION: This error could indicate a software driver or firmware problem. If problems persist report these errors to customer service.

lpfcN: 20: FCP completion error

DESCRIPTION: An FCP command completed with a status error in the IOCB. The IOCB status, the IOCB parameter error, as well as the PortID this FCP command was directed to are recorded.

LOG: ERROR always fcscsib.

ACTION: If there are many errors to one device, check physical connections to Fibre Channel network and the state the remote PortID is in.

lpfcN: 24: Command ring timeout

DESCRIPTION: An IOCB command was posted to a ring and did not complete within a timeout based on ratov. The ring number and the IOCB command are recorded.

LOG: ERROR always fcscsib.c

ACTION: This error could indicate a software driver or firmware problem. If no I/O is going through the adapter, reboot the system. If these problems persist, report the errors to Technical Support.

lpfcN: 25 : Mailbox command timeout

DESCRIPTION: A Mailbox command was posted to the adapter and did not complete within 30 seconds. the Mailbox command and status are recorded.

LOG: ERROR always fcscsib.c

ACTION: This error could indicate a software driver or firmware problem. If no I/O is going through the adapter, reboot the system. If these problems persist, report the errors to customer service.

lpfcN: 26: FAN timeout

DESCRIPTION: We received a link up event without the login bit set, so the driver waits E_D_TOV for the Fabric to send a FAN. If no FAN if received, a FLOGI will be sent after the timeout.

LOG: WARNING always fcscsib.c

ACTION: None needed. The driver recovers from this with a FLOGI to the Fabric.

lpfcN: 27: NameServer Registration timeout

DESCRIPTION: Our registration request to the Fabric is not acknowledged within ratov.

LOG: WARNING always fcscsib.c

ACTION: Check Fabric configuration. The driver recovers from this and continues with device discovery.

lpfcN: 28: Nameserver Query timeout

DESCRIPTION: Node Authentication timeout or Node Discovery timeout. A NameServer Query to the Fabric or discovery of reported remote NPorts is not acknowledged within R_A_TOV.

LOG: WARNING always fcscsib.c

ACTION: Check Fabric configuration. The driver recovers from this and continues with device discovery.

lpfcN: 29: pt2pt timeout

DESCRIPTION: This indicates a PLOGI has not been received, within R_A_TOV, after a successful FLOGI, which indicates our topology is point to point with another N_Port. Typically this PLOGI is used to assign a N_Port ID.

LOG: WARNING always fcscsib.c

ACTION: None Needed, driver will recover by configuring N_Port ID as 0.

lpfcN: 30: SCSI timeout

DESCRIPTION: An FCP IOCB command was posted to a ring and did not complete within ULP timeout seconds. The IOCB command, N_Port ID and SCSI ID are recorded.

LOG: WARNING FCP verbose fcscsib.c

ACTION: If no I/O is going through the adapter, reboot the system; otherwise check the state of the target in question.

lpfcN: 31 : Link [Up Down] Event received [ALPA map]

DESCRIPTION: Either a link up or link down link event is received. It is also possible for multiple link events to be received together. If this happens, the current event number, last event number received, ALPA granted, and number of entries in the loop init LILP ALPA map are recorded. For a Link Up, an ALPA map message is also recorded if LINK_EVENT verbose mode is set. Each ALPA map message contains 16 ALPAs.

LOG: WARNING always / LINK_EVENT fcscsib.c

ACTION: If numerous link events are happening, check physical connections to Fibre Channel network.

lpfcN: 32: Unknown Mailbox completion

DESCRIPTION: An unsupported or illegal Mailbox command completed. The unknown value is recorded.

LOG: ERROR always fcscsib.c

ACTION: This error could indicate a software driver or firmware problem. If problems persist report these errors to Technical Support.

lpfcN: 33: SCSI Link reset

DESCRIPTION: The SCSI layer has determined the link needs to be reset. A LIP is sent to restart loop initialization.

LOG: WARNING always fcscsib.c

ACTION: None Needed.

lpfcN: 34: Bring Adapter online

DESCRIPTION: The driver has received a request to bring the adapter online. This may happen when running lputil.

LOG: WARNING always fcscsib.c

ACTION: None Needed.

lpfcN: 35: Bring adapter offline

DESCRIPTION: The driver has received a request to bring the adapter offline. This may happen when running lputil.

LOG: WARNING always fcscsib.c

ACTION: None Needed.

lpfcN: 36 : Abort Target I/O: clearq

DESCRIPTION: This is displayed if the driver internally detects that it needs to abort all I/O to a specific device. This results in a Fibre Channel ABTS to abort the I/O in process. The target N_Port ID, SCSI ID, and LUN are recorded.

LOG: WARNING FCP verbose fcscsib.c

ACTION: Check state of target in question.

lpfcN: 37 : Abort Target I/O: issue_abort

DESCRIPTION: This is displayed if the SCSI layer detects that it needs to abort all I/O to a specific device. This results in an FCP Task Management command to abort the I/O in progress. The target N_Port ID, SCSI ID, and LUN are recorded.

LOG: WARNING always fcstratb.c

ACTION: Check state of target in question.

lpfcN: 38 : FCP command failed

DESCRIPTION: This indicates a target has sent us a FCP RSP error. Because of the amount of information that needs to be recorded, two back to back messages are generated. The first records the IOCB information, the IOCB cmd, Iotag, status, and parameter error field. The second records FCP information, N_Port ID, SCSI ID, LUN, and FCP response status bytes.

LOG: WARNING FCP verbose fcscsib.c

ACTION: Check the state of the target in question.

lpfcN: 39 : Cannot issue FCP command

This indicates we no longer have a valid login with a target. The target N_Port ID, SCSI ID, and LUN are recorded.

LOG: WARNING always fcstratb.c

ACTION: Check the state of the target in question.

lpfcN: 40 : No room on IP xmit queue

DESCRIPTION: This message indicates the system is generating IOCB commands to be processed, faster than the adapter can process them.

LOG: WARNING IP verbose fcxmitb.c

ACTION: Check the state of the link. If the link is up and running, reconfigure the xmit queue size to be larger. Note, a larger queue size may require more system IP buffers. If the link is down, check physical connections to Fibre Channel network.

lpfcN: 41 : Stray XmitSequence completion

DESCRIPTION: Received an XMIT_SEQUENCE IOCB completion without issuing a corresponding XMIT_SEQUENCE Command (based on the iotag field in the XMIT_SEQUENCE_CR iocb). The IOCB command and iotag used to match are recorded.

LOG: ERROR always fcxmitb.c

ACTION: This error could indicate a software driver or firmware problem. If problems persist report these errors to Technical Support.

lpfcN: 42 : Xmit sequence completion error

DESCRIPTION: A XMIT_SEQUENCE command completed with a status error in the IOCB. The IOCB status, the IOCB iotag, the IOCB parameter error, as well as the PortID this command was directed to are recorded. The driver attempts to recover by creating a new exchange to the remote device.

LOG: WARNING IP verbose fcxmitb.c

ACTION: If there are many errors to one device, check physical connections to Fibre Channel network and the state the remote PortID is in.

lpfcN: 43 : Stray CreateXRI completion

DESCRIPTION:Received a CREATE_XRI command completion without issuing a corresponding CREATE_XRI Command (based on the iotag field in the CREATE_XRI_CR iocb). The IOCB command and iotag used to match are recorded.

LOG: ERROR always fcxmitb.c

ACTION: This error could indicate a software driver or firmware problem. If problems persist report these errors to customer service.

lpfcN: 43 : Stray CreateXRI completion

DESCRIPTION: Received a CREATE_XRI command completion without issuing a corresponding CREATE_XRI command (based on the IOTAG field in the CREATE_XRI_CR IOCB). The IOCB command and IOTAG used to match are recorded.

LOG: ERROR always fcxmitb.c

ACTION: This error could indicate a software driver or firmware problem. If the problems persist, report these errors to Technical Support.

lpfcN: 44 : Adapter failed to initialize

DESCRIPTION: The host adapter failed to initialize properly. The status register is recorded.

LOG: ERROR always lp6000.c

ACTION: This error usually indicates a hardware problem with the adapter, run diagnostics.

lpfcN: 45 : Adapter initialization failed, Mailbox command

DESCRIPTION: The host adapter failed to initialize properly because a mailbox command failed. The mailbox command and mailbox status value are recorded.

LOG: ERROR always lp6000.c

ACTION: This error usually indicates a hardware problem with the adapter, run diagnostics.

lpfcN: 46 : RUN_BIU_DIAG failed

DESCRIPTION: The host adapter failed to initialize properly because a PCI bus DMA test failed.

ERROR always lp6000.c

ACTION: This error usually indicates a hardware problem with the adapter, run diagnostics.

lpfcN: 47 : WorldWide PortName doesn't conform to IP Profile

DESCRIPTION: In order to run IP, the WorldWide PortName must be of type IEEE (NAA = 1). This message is display if the adapter WWPN doesn’t conform to the standard. The NAA is recorded.

LOG: ERROR always lp6000.c

ACTION: Turn off the network-on configuration parameter or have a different WWPN assigned.

lpfcN: 48 : Enable interrupt handler failed

DESCRIPTION: This error occurs if the driver cannot assign an interrupt vector to the host adapter.

LOG: ERROR always lp6000.c

ACTION: Check the configuration of the adapter in the system.

lpfcN: 49 : Adapter Hardware Error

DESCRIPTION: A FireFly error interrupt occured and the status register indicates a non-recoverable error. The adapter status register is recorded.

LOG: ERROR always lp6000.c

ACTION: This error usually indicates a hardware problem with the adapter, run diagnostics.

lpfcN: 50 : Stray Mailbox Interrupt

DESCRIPTION: Received a mailbox command completion and the mailbox is not owned by the host. The mailbox command and status are recorded.

LOG: ERROR always lp6000.c

ACTION: This error could indicate a software driver or firmware problem. If the problems persist, report these errors to Technical Support.

lpfcN: 51 : [29,xx] Check condition received

DESCRIPTION: Could indicate a problem with an FCP target. The check condition response info fields are recorded. A 29,xx check condition is recorded only in verbose mode.

LOG: ERROR always lp6000.c

ACTION: Check the state of the FCP target

lpfcN: 52 : [Xmit Received] ELS [command response]

DESCRIPTION: Could indicate a problem with an FCP target. The check condition response info fields are recorded. A 29,xx check condition is only recorded in verbose mode.

LOG: WARNING ELS verbose fcelsb.c

ACTION: No action needed.

HP-UX-Specific Errors (100 - 109)

General HP-UX error codes range from 100 to 109. HP-UX FCP-specific error codes range from 100 to 139.

lpfcN: 100 : Attach failure: XXXXX

DESCRIPTION:The driver attach routine failed for reason XXXXX. The assigned DIP and attach routine cmd are recorded.

LOG: ERROR always fcHPUX.c

ACTION: This error could indicate a software driver or firmware problem. If the problems persist, report these errors to Technical Support.

lpfcN: 101 : Detach failure: XXXXX

DESCRIPTION: The driver detach routine failed for reason XXXXX. The assigned DIP and attach routine cmd are recorded.

LOG: ERROR always fcHPUX.c

ACTION: This error could indicate a software driver or firmware problem. If the problems persist, report these errors to Technical Support.

lpfcN: 102 : Config error: XXXXX

DESCRIPTION: Parameter XXXXX in the driver conf file has a bad value. The bad value and new value are recorded.

LOG: ERROR always fcHPUX.c

ACTION: Check the driver .conf file, usually located in /opt/lpfc/conf/lpfc.conf

lpfcN: 103 : fc_malloc: XXXXX

DESCRIPTION: The driver memory allocation routine failed for reason XXXXX. Various memory allocation parameters are recorded.

LOG: ERROR always fcHPUX.c

ACTION: This error could indicate a software driver or firmware problem. If the problems persist report, these errors to Technical Support.

lpfcN: 104 : fc_bufmap: XXXXX

DESCRIPTION: The driver memory mapping routine failed for reason XXXXX. Various memory mapping parameters are recorded.

LOG: ERROR always fcHPUX.c

ACTION: This error could indicate a software driver or firmware problem. If the problems persist, report these errors to Technical Support.

lpfcN: 121 Override default targetX SCSI options

DESCRIPTION: The message indicates that the default SCSI options for target X have been overridden. The SCSI ID, new SCSI option, and default SCSI option is recorded.

LOG: WARNING FCP verbose fcHPUX.c

ACTION: No action needed.

lpfcN: 122 Override default SCSI tag age limit

DESCRIPTION: The default SCSI tag age limit has been overridden. The new tag age and default tag age are recorded.

LOG: WARNING FCP verbose fcHPUX.c

ACTION: No action needed.

lpfcN: 123 Override default SCSI reset delay

DESCRIPTION: The default SCSI reset delay has been overridden. The new reset delay and default reset delay are recorded.

LOG: WARNING FCP verbose fcHPUX.c

ACTION: No action needed.

lpfcN: 124 Exceeded max s/g size

DESCRIPTION: The scatter/gather elements received by the driver exceeded the number (64) it can handle. The SCSI ID, LUN, the number of elements supported and number of elements received from the upper layer are recorded.

LOG: ERROR always fcHPUX.c

ACTION: This error could indicate an HP-UX problem. To work around this error, you can issue smaller I/Os, or install more memory. If the problems persist, report these errors to Technical Support.

lpfcN: 125 DMA allocation error

DESCRIPTION: Indicates an error for allocating a DMA memory. The MALLOC status error is recorded.

LOG: ERROR always fcHPUX.c

ACTION: This error could indicate a software driver or firmware problem. If the problems persist, report these errors to Technical Support.

lpfcN: 128 Invalid FCP Response Code received

DESCRIPTION: An invalid FCP response code has been received. The SCSI ID, LUN and FCP task mgmt response status (rspinfo3) are recorded.

LOG: ERROR always fcHPUX.c

ACTION: This error could indicate a software driver or target problem. If the problems persist, report these errors to Technical Support.

lpfcN: 129 FCP Read Check Error

DESCRIPTION: The adapter detects corrupted and missing frames, which happen only when an entire sequence is dropped. The IOCB cmd, FCP response SCSI status (rspinfo2) and FCP task mgmt response status (rspinfo3) are recorded.

LOG: WARNING FCP verbose fcHPUX.c

ACTION: Check the link connection to the target.

lpfcN: 130 SCSI Auto Sense is not enabled

DESCRIPTION: The target driver can either issue a SCSI Request Sense command when the error occurred or enable the AutoSense capability through the driver interface routine. The SCSI ID and LUN are recorded.

LOG: WARNING FCP verbose fcHPUX.c

ACTION: No action needed.

lpfcN: 131 Can’t copy ARQ data, size mismatch

DESCRIPTION: The SCSI ARQ status buffer is greater than the SCB length. The SCSI ID, LUN, SCB length and length of the buffer are recorded.

LOG: ERROR always fcHPUX.c

ACTION: This error could indicate a software driver or firmware problem. If the problems persist, report these errors to Technical Support.